MISCELLANEOUS NOTES ON *HAPLOPHYTON* (APOCYNACEAE: PLUMERIEAE: HAPLOPHYTINAE)

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ABSTRACT

The genus *Haplophyton* has typically been regarded as monotypic by various authors. A close examination of herbarium specimens coupled with field observations in Chiapas, Mexico, has uncovered new evidence that strengthens the recognition of two distinct species, *H. cimicidum* and *H. crooksii*. Further evidence suggests that *Haplophyton* should be removed from the subtribe Alstoniinae and placed back into its own subtribe, the Haplophytinae. Distribution maps and a key to the species are provided.

KEY WORDS: *Haplophyton, Alstonia*, Haplophytinae, Alstoniinae, Apocynaceae

RESUMEN

El género *Haplophyton* ha sido tratado como monotípico por varios autores. Un cuidadoso examen de especímenes de herbario junto con observaciones de campo en Chiapas, México, ha puesto de manifiesto nuevas evidencias que refuerzan el reconocimiento de dos especies distintas: *H. cimicidum y H. crooksii*. Otras evidencias suplementarias sugieren que *Haplophyton* debería ser sacado de la subtribu Alstoniinae para volverlo a colocar en su propia subtribu Haplophytinae. Se ofrecen mapas de distribución y una clave de especies.

De Candolle (1844) described *Haplophyton* as a monotypic genus based upon *H. cimicidum*. Benson (1942) added a variety to the species, var. *crooksii*, later elevating it to the rank of species (Benson 1943) when material of mature seeds was examined. Benson (1954) regarded *H. crooksii* as a distinct taxon because of its smaller leaves and smaller discontinuously ridged seeds. Various authors (Johnston 1990; Kartesz 1994; Leeuwenberg 1994; Pichon 1950), however, disregarded these differences and recognized only *H. cimicidum*. My examination of the specimens housed at LL, TEX coupled with field observations in Chiapas, Mexico, however, has uncovered new evidence that strengthens the recognition of two distinct species.

The genus *Haplophyton* is placed in the subfamily Plumerioideae because of its undifferentiated free anthers and indole alkaloides. These characters, in particular the indole alkaloides, are regarded as indicative of a monophyletic lineage (Leeuwenberg 1994). In addition, sinistrorse aestivation of the corolla (overlapping of the petals in bud to the left) distinguishes the

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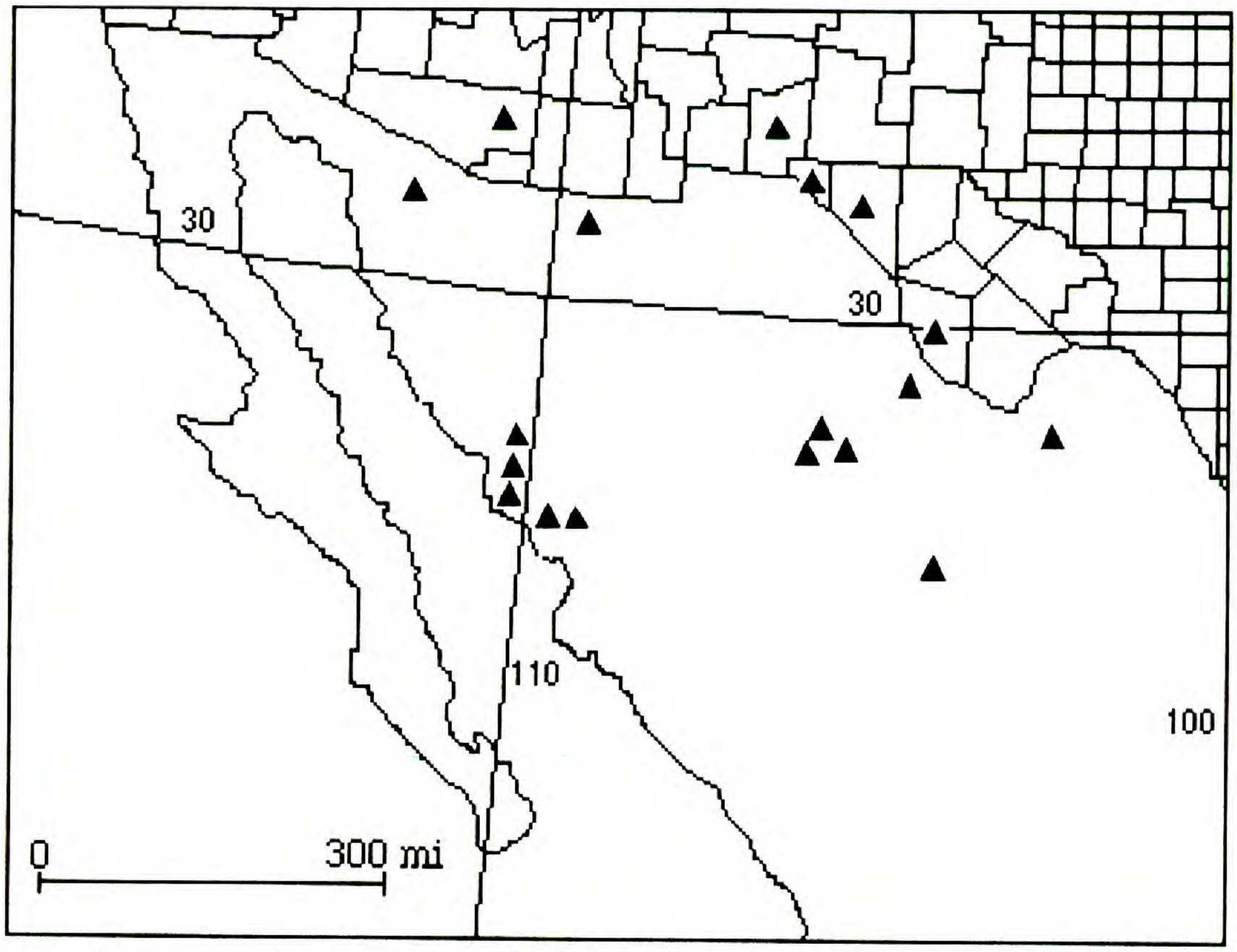

FIG. 1. Documented distribution of *Haplophyton crooksii*.

Plumerioideae from the Apocynoideae, which has dextrorse aestivation (overlapping of the petals in bud to the right) (Leeuwenberg 1994). The aestivation of *Haplophyton*, however, has been under considerable question. De Candolle (1844) described *Haplophyton* as sinistrorsely contorted, while Bentham and Hooker (1873) listed the taxon as having a dextrorse aestivation. Pichon (1950) also pointed out that *Haplophyton* had a "curious" dextrorse aestivation. Woodson (1938) on the other hand reported a sinistrorse aestivation for *Haplophyton*, as did Standley and Williams (1969), and Correll and Johnston (1970). Benson (1942, 1943, 1954) did not describe the aestivation. An examination of herbarium specimens, however, reveals that the above reports are all correct. The southwestern United States and northern Mexican (Fig. 1) members of *Haplophyton* have an aestivation to the left, while the Guatemalan and southern Mexican (Fig. 2) members have an aestivation to the right. The correlation of this character with the allopatric distribution of the two populations provides strong evidence that *Haplophyton* is comprised of two distinct species. My field studies in El Chorreadero, Chiapas (*Williams & Plum, 95-34*) confirm that southern populations have a dextrorse aestivation.

When de Candolle (1844) described *Haplophyton cimicidum* he reported a sinistrorse aestivation, and listed as the type a specimen from Tehuantepec, Oaxaca. Topotypes from this region, however, have a dextrorse aestivation.

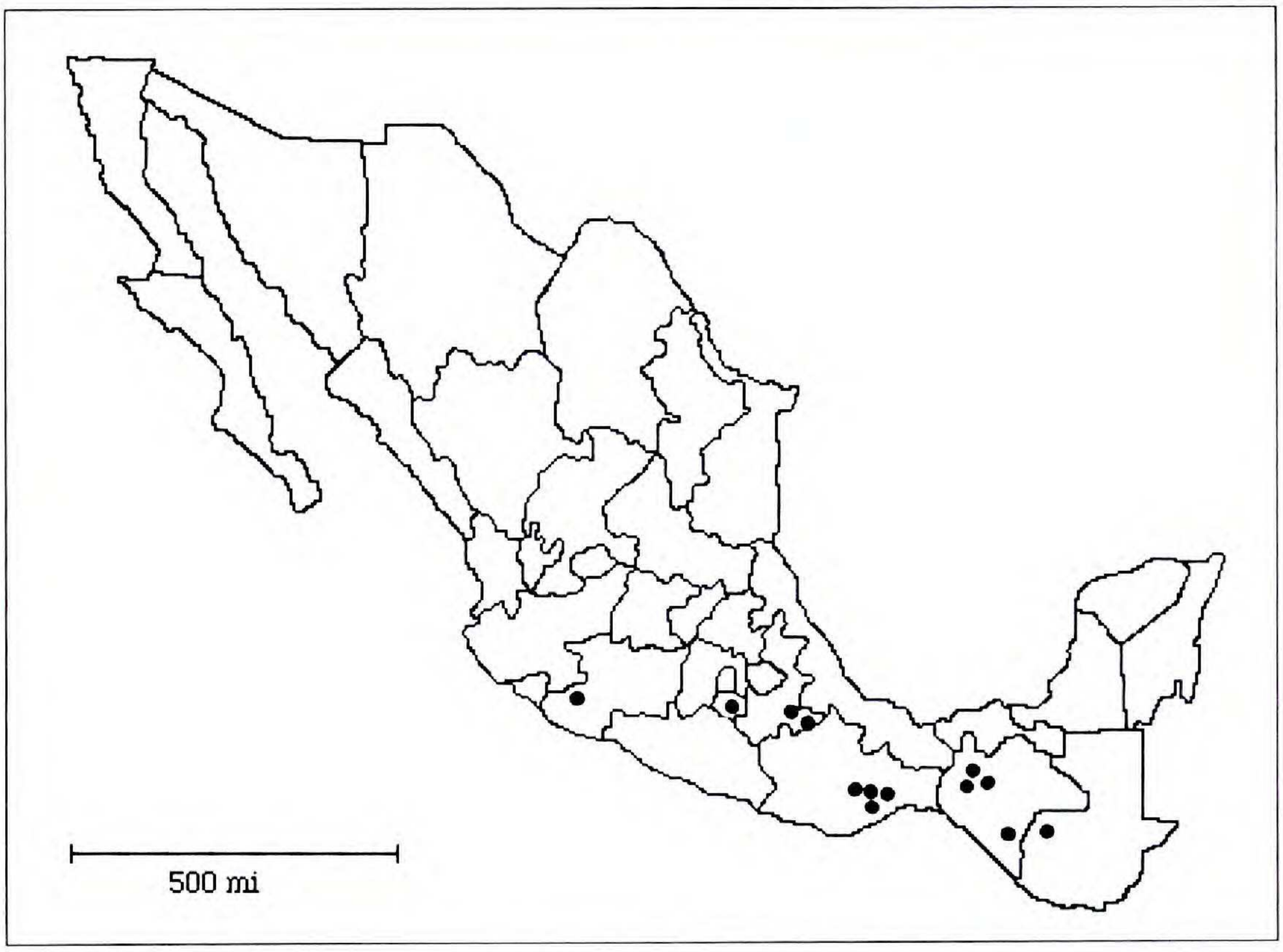

FIG. 2. Documented distribution of *Haplophyton cimicidum*.

Because I have not had an opportunity to examine the type, its aestivation remains at present undetermined. I suspect, however, that it is to the right and that the reports of a sinistrorse aestivation are either from specimens examined from the north or are the result of the presupposition that all Plumerioideae flowers have aestivation to the left.

Differences in the corolla tube and calyx dimensions have not until now been discussed as segregating factors between the two species, but my examination of herbarium specimens shows that *H. cimicidum* possesses a longer corolla tube than *H. crooksii*, as well as smaller calyx lobes. An examination of the seeds, in particular their size and surface structures, also supports Benson's (1943) assertions that the two species are distinct. A character that seems to tentatively hold true is the color of the coma which is typically golden yellow in *H. cimicidum* and charcoal grey in *H. crooksii*.

The populations in Guaymas, southwestern Sonora, superficially resemble *H. cimicidum* in leaf size; accordingly Benson (1943, 1954) recognized them as such. A close inspection of these individuals, however, shows that their aestivation is to the left and that the seeds are 6–8 mm long, placing them with *H. crooksii*.

With its sinistrorse aestivation, larger calyx lobes, smaller corolla tube, smaller seeds, and isolated geographical range, it seems evident that

Haplophyton crooksii constitutes a distinct element from *H. cimicidum* and, consequently, necessitates the recognition of two species for *Haplophyton*.

KEY TO SPECIES OF *HAPLOPHYTON*

1. Petals of the bud overlapping to the right; leaves 22–65 mm long, 11–26 mm wide; corolla tube 8–10 mm long; sepals 3–5 mm long, less than half the length of corolla tube; seeds 8–11 mm long, vertical ridges of seeds continuous; coma yellowish; Guatemala and southern Mexico ..... 1. *H. cimicidum*
1. Petals of the bud overlapping to the left; leaves 11–35 (50) mm long, 3–12 mm wide; corolla tube 6–8 mm long; sepals 4–11 mm long, longer than or equal to half the length of corolla tube; seeds 6–8 mm long, vertical ridges of seeds broken by transverse grooves; coma white to charcoal grey; south western United States and northern Mexico ..... 2. *H. crooksii*

1. Haplophyton cimicidum A. DC., Prodr. 8:412. 1844. TYPE: MEXICO. OAXACA: Tehuantepec, 1833, *Andrieux 250* (HOLOTYPE: G-DC).

Representative specimens. GUATEMALA. HUEHUETENANGO: between the villages of Nenton and Llano Grande (15°48'N; 91°45'W), growing in dry subtropical forest, 16 Nov 1993, *Castillo 1638* (F).

MEXICO. CHIAPAS: steep wooded slopes 9 km N of Tuxtla Gutiérrez along road to El Sumidero, 27 Oct 1965, *Breedlove 13850* (TEX); steep canyon, tropical deciduous forest, 15 km SW of Suchiapa, along road to Villa Flores, 750 m, 26 Sep 1972, *Breedlove 28068* (TEX); El Chorreadero, 200 yds. outside entrance to waterfall park, along road, growing in the open, below rocky hillside with *Capraria frutescens*, 7 Jan 1995, *Williams & Plum 95-34* (TEX). MORELOS: in limestone soil on side of the ruins of Xochicalco, 16 Aug 1947, *Rodrigo 710B* (TEX). MICHOACAN: in El Carrizo, 30 km SW of Tepalcatepec, 570 m, 25 Aug 1980, *Núñez 2496* (TEX). OAXACA: tropical deciduous forest on SE slopes of Sierra Madre del Sur, 22 km W of Tequisistlán on Pan-Am hwy to Oaxaca, 1000 m, (16°23' N; 95°45'W), 4 Jul 1969, *Marcks 993* (TEX); 55 mi SE of Oaxaca along road to Tehuantepec, in mountains 9 mi NW of La Junta, 13 Sep 1971, *Clarke 20463-1* (TEX); 52 km S of Tecomavaca, along the road to Oaxaca, 31 Jul 1985, *Salinas F-2671* (TEX); open areas 9–10 km E of La Ventosa along Pan-Am hwy (rt 190), 50 m, 16 Jul 1959, *King 1717* (TEX); ruinas del Cerro Guiengola (16°21'N; 95°19' W), 450 m, 26 Nov 1986, *Torres 533* (TEX); La Huerta, 20 km NE of Tepelmeme of Morelos, 9 Oct 1970, *Cisneros 2560* (TEX); 15 km N of La Ventosa, 120 m, 25 Nov 1986, *Mendoza 2768* (TEX). PUEBLA: 4 km S of Coxcatlán, 1100 m, 29 Jul 1983, *Chiang 2370* (TEX); about 6.5 km SW of Axusco (18°12'N; 97°12'W), 27 Jun 1987, *Salinas 4079* (TEX).

2. Haplophyton crooksii (L. D. Benson) L. D. Benson, Amer. J. Bot. 30:630. 1943. BASIONYM: *Haplophyton cimicidum* var. *crooksii* L. D. Benson, Torreya 42:9. 1942. TYPE: U.S.A. ARIZONA: Pima Co.: "prison road" soldier trail hwy, Santa Catalina Mts, 27 Dec 1939, *Crooks & Darrow s.n.* (HOLOTYPE: ARIZ; ISOTYPE: B).

Representative specimens. U.S.A. ARIZONA: **Pima Co.**: end of Roger road, Rincon foothills, E of Tucson, 3200 ft, 25 Aug 1985, *Van Devender 85-179* (TEX). NEW MEXICO: **Dona Ana Co.**: Dona Ana Mts, ca 15 mi N of Las Cruces, S slope of Summerford Mt, 26 Aug 1973, *Todsen s.n.* (TEX). TEXAS: **El Paso Co.**: Franklin Mts, 1.1 mi W jct Trans-Mountain road (loop 375) and Gateway S (31°53'N; 106°27'W), southern exposure of granite boulders, 4600 ft, 26 Aug 1978, *Worthington 3207* (TEX). **Hudspeth Co.**: lime-

stone crevices throughout the canyon at the head of the Davis Arroyo, an intermontane basin in the Quitman Mts, 17 Apr 1976, *Butterwick 2377* (TEX). **Presidio Co.**: near mouth of narrow canyon draining S slope of the W Chinatis, among igneous boulders, 4800 ft, 14 Jun 1977, *Butterwick 3857b* (TEX).

MEXICO. CHIHUAHUA: ca 20 km ENE of Ciudad Jiménez, in limestone arroyo in canyon NW of summit of Sierra de Chupaderos (27°12'N; 104°43'W), 5100 ft, 2 Oct 1973, *Henrickson 13765* (TEX); ca 31 mi NW of Julimes in SW facing canyon above Rancho El Recuerdo in Sierra de Carrasco (28°47'N; 105°09'W), 4400 ft, 15 Sep 1973, *Henrickson 12941* (TEX); 46 km W of Ojinaga on hwy to Chihuahua City and S 2 km to the deep canyon of Rio Conchos in the Sierra de Pegüis (29°32'N; 104°48'W), 1000 m, 20 Oct 1972, *Chiang et al. 9757* (TEX); S slope and top of Sierra del Roque, NNE of Julimes approached from Mina Las Playas via Rancho El Saucito (28°39'N; 105°18'W), 19 Jun 1973, *M.C. Johnston et al. 11386B* (TEX). COAHUILA: S side of Cerro San José de las Piedras (28°42' N; 102°51'W), 1000–1400 m, 8 Jun 1972, *Chiang et al. 7555* (TEX); 0.5 km E of Matrimonio Viejo, E end of limestone ridge (27°08'N; 103°07'W), 1125 m, 2 Sep 1972, *Chiang 9122* (TEX). SONORA: Sierra Bojihuacame SE of Obregon, 800–2000 ft, 17–25 Oct 1954, *Gentry 14482* (TEX); talus slope of low basaltic hill, 15 mi S of La Palma, between La Palma and Guaymas, 2 Sep 1941, *Wiggins 226* (TEX); Río Mayo area, hill with microwave tower, 9 mi NW of Alamos and 4 mi SSW of Piedras Verde (27°07'N; 109°02'W), 500–700 m, 6 Sep 1989, *Sanders 9435* (TEX); Cañon de Nacapules, 6 km NE of Bahîa San Carlos, deep riparian canyon, 19 Oct 1984, *Felger 84-122* (TEX).

In his classification of *Haplophyton*, Pichon (1950) erected the monogeneric subtribe, Haplophytinae. He discussed its affiliation with the Catharanthinae, but ended by questioning the relationship, remarking that "the lignification of the branches [in *Haplophyton*] seems to be rather rapid and the plant has nothing in common in this point of view with the Catharanthinae" (Pichon 1950; p. 161). Leeuwenberg (1994) subsequently positioned *Haplophyton* with *Alstonia* R. Br. in the Alstoniinae, near the Catharanthinae, on the basis that both genera are the only two taxa in the Plumerioideae to possess hairy seeds. Seed pubescence in the Alstoniinae, however, is heteromorphic. *Haplophyton* has seeds with both apical and basal coma, while *Alstonia* has seeds with either membranous ciliations (sect. *Tonduzia*) or with both apical and basal coma (sect. *Monuraspermum*) (Monachino 1949).

The dextrorse aestivation found in *Haplophyton*, suggests a close relationship with *Alstonia*, which also displays dextrorse aestivation. Indeed, *Haplophyton cimicidum* may be related to the Oceanic species of *Alstonia* (sect. *Monuraspermum*), which have flowers with dextrorse aestivation and seeds with both apical and basal coma (Monachino 1949). Presently, however, it is not known whether or not dextrorse aestivation in *Haplophyton* is ancestral or derived.

Alstonia is the only other genus in the tribe Plumerieae, besides the genera of the Catharanthinae (excluding *Vinca* (Lawrence 1959)), to retain a reflexed membranous appendage basal to the stigma throughout its ontogeny (Pichon 1950). Woodson (1928) noted, however, that a swollen region

occurs below the stigmas of *Haplophyton*. In his view, this character probably represents a primitive stage of the more complex appendage found in the Catharanthinae. Preliminary studies of *Haplophyton* herbarium specimens, by the author, reveal that the style heads of immature buds have a membranous skirt below them. This feature, however, was not present in mature (opened) flowers in either the field or herbarium specimens.

Pichon (1950) also suggested an affiliation between *Haplophyton* and *Anechites*, stating that the two genera are unique in the family by having hairs with multicellular bases (Fallen 1983). Pichon, however, placed each of these genera in monotypic subtribes, suggesting that their relationships were unresolved. *Anechites* was subsequently positioned in the subtribe Condylocarpinae of the subfamily Plumerioideae (Leeuwenberg 1994).

Haplophyton differs from *Alstonia* sect. *Monuraspermum* in being a suffruticose herb (vs. tree), having alternate (vs. whorled) leaves, hairs with multicellular bases (vs. simple), no nectary (vs. an annular nectary), solitary flowers (vs. cymous), and its restriction to the New World (vs. Oceania). These differences suggest that *Haplophyton* is not related to *Alstonia*. Until further evidence is presented, the most suitable and conservative course favors placing *Haplophyton* in the monogeneric subtribe Haplophytinae (Pichon 1950) of the tribe Plumerieae, and not with *Alstonia* in the Alstoniinae (Leeuwenberg 1994) whose resemblance to *Haplophyton* is at present questionable.

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